

What is claimed is:

1. A method for increasing rate of thermal inactivation of a pathogen in a nutriment, comprising:
contacting the nutriment with an acidulant.
- 5 2. The method of claim 1, wherein the acidulant comprises: (a) an acidic, or low pH, solution of sparingly-soluble Group IIA complexes ("AGIIS"); (b) a highly acidic metalated mixture of inorganic acid ("HAMMIA"); (c) a highly acidic metalated organic acid ("HAMO"); (d) a mixture of the above; or (e) an adduct of each of the above.
- 10 3. The method of claim 1, wherein the nutriment comprises an animal product, a plant product, a beverage, or a mixture thereof.
4. A method for increasing rate of thermal inactivation of a pathogen in a nutriment, comprising:
 contacting the nutriment with a solution or suspension of an
15 acidic sparingly-soluble Group IIA complex ("AGIIS"), wherein the AGIIS is isolated from a mixture comprising a mineral acid and a Group IIA hydroxide, or a Group IIA salt of a dibasic acid, or a mixture of the two.
5. The method of claim 4, wherein the Group IIA hydroxide comprises calcium hydroxide, the mineral acid comprises sulfuric acid, and the
20 Group IIA salt of a dibasic acid comprises calcium sulfate.
6. The method of claim 4, further comprising adding an additive to the AGIIS.
7. The method of claim 6, wherein the additive comprises an alcohol.
- 25 8. The method of claim 6, wherein the additive comprises an organic acid or an periodic acid.

9. The method of claim 6, wherein the additive comprises a surfactant.

10. The method of claim 4, wherein the nutriment comprises an animal product, a plant product, a beverage, or a mixture thereof.

5 11. The method of claim 4, wherein the nutriment comprises a meat product.

12. A method for increasing rate of thermal inactivation of pathogen in a nutriment comprising:

10 contacting a solution or suspension of an acidic sparingly-soluble Group IIA complex ("AGIIS") with a carrier to give a constituted carrier, wherein the AGIIS is isolated from a mixture comprising a mineral acid and a Group IIA hydroxide, or a Group IIA salt of a dibasic acid, or a mixture of the two; and

blending the constituted carrier with the nutriment.

15 13. A method for increasing rate of thermal inactivation of pathogen in a nutriment comprising:

20 contacting a solution or suspension of an acidic sparingly-soluble Group IIA complex ("AGIIS") with an additive and with a carrier to give a constituted carrier having the additive, wherein the AGIIS is isolated from a mixture comprising a mineral acid and a Group IIA hydroxide, or a Group IIA salt of a dibasic acid, or a mixture of the two; and

blending the nutriment with the constituted carrier having the additive.

14. A method for increasing rate of thermal inactivation of a pathogen in a nutriment comprising:

contacting a solution or suspension of a highly acidic metalated organic acid ("HAMO") with the nutriment, wherein the solution or suspension

5 of the HAMO is prepared by mixing ingredients comprising:

at least one regenerating acid having a first number of equivalents;

at least one metal base having a second number of equivalents;

and

10 at least one organic acid; wherein the first number or equivalents of the regenerating acid is greater than that of the second number of equivalents of the metal base.

15 15. The method of claim 14, wherein the regenerating acid comprises a strong oxyacid of sulfur, phosphorus, nitrogen, chromium, or iodine.

16. The method of claim 14, wherein the regenerating acid comprises sulfuric acid, phosphoric acid, or an acidic solution of sparingly-soluble Group IIA complex ("AGIIS").

20 17. The method of claim 14, further comprising adding an additive to the HAMO.

18. The method of claim 17, wherein the additive comprises an alcohol, an organic acid, a surfactant, a periodic acid, or a mixture thereof.

19. The method of claim 14, wherein the nutriment comprises an animal product, a plant product, a beverage, or a mixture thereof.

25 20. The method of claim 14, wherein the nutriment comprises a meat product.

21. A method for increasing rate of thermal inactivation of pathogen in a nutriment comprising:

contacting a solution or suspension of a highly acidic metalated organic acid ("HAMO") with a carrier to give a constituted carrier, wherein the solution or suspension of the HAMO is prepared by mixing ingredients comprising:

at least one regenerating acid having a first number of equivalents;

at least one metal base having a second number of equivalents;

and

at least one organic acid; wherein the first number or equivalents of the regenerating acid is greater than that of the second number of equivalents of the metal base; and

blending the constituted carrier with the nutriment.

22. A method for increasing rate of thermal inactivation of a pathogen in a nutriment, comprising:

contacting the nutriment with a solution or suspension of a highly acidic metalated mixture of inorganic acid ("HAMMIA") having an acidic pH, wherein the HAMMIA is prepared by mixing ingredients comprising:

a salt of phosphoric acid; and

a preformed, or in-situ generated, solution or suspension of an acidic sparingly-soluble Group IIA complex ("AGIIS"), wherein the solution or suspension of AGIIS is in an amount in excess of the amount required to completely convert the salt of phosphoric acid to phosphoric acid and sufficient to render the acidic pH of the HAMMIA to be less than about 2.

23. The method of claim 22, wherein the solution or suspension of the AGIIS is isolated from a mixture comprising a mineral acid and a Group IIA hydroxide, or a Group IIA salt of a dibasic acid, or a mixture of the two.

24. The method of claim 22, wherein the Group IIA hydroxide
5 comprises calcium hydroxide, the mineral acid comprises sulfuric acid and the Group IIA salt of a dibasic acid comprises calcium sulfate.

25. The method of claim 22, wherein the salt of phosphoric acid comprises a divalent metal salt of phosphoric acid.

26. The method of claim 22, wherein the divalent metal comprises
10 an alkali earth metal or a metal of first transition series.

27. The method of claim 22, wherein the salt of phosphoric acid comprises a mono-valent metal salt of phosphoric acid.

28. The method of claim 22, wherein the mono-valent metal comprises an alkali metal.

29. The method of claim 22, further comprising adding an additive
15 to the HAMMIA.

30. The method of claim 22, wherein the additive comprises an alcohol, an organic acid, a surfactant, a periodic acid, or a mixture thereof.

31. The method of claim 22, wherein the nutriment comprises an
20 animal product, a plant product, a beverage, or a mixture thereof.

32. A method for increasing rate of thermal inactivation of pathogen in a nutriment comprising:

contacting a carrier with a solution or suspension of a HAMMIA having an acidic pH to give a constituted carrier, wherein the HAMMIA is prepared by mixing ingredients comprising:

a salt of phosphoric acid; and

a preformed, or in-situ generated, solution or suspension of an acidic sparingly-soluble Group IIA complex ("AGIIS"), wherein the solution or suspension of AGIIS is in an amount in excess of the amount required to completely convert the salt of phosphoric acid to phosphoric acid and sufficient to render the acidic pH of the HAMMIA to be less than about 2; and

blending the constituted carrier with the nutriment.

33. A method for increasing rate of thermal inactivation of a pathogen in a nutriment, comprising:

chilling the nutriment to give a chilled nutriment; and
contacting the chilled nutriment with an acidulant.

34. The method of claim 35, wherein the acidulant comprises: (a) an acidic, or low pH, solution of sparingly-soluble Group IIA complexes ("AGIIS"); (b) a highly acidic metalated mixture of inorganic acid ("HAMMIA"); (c) a highly acidic metalated organic acid ("HAMO"); (d) a mixture of the above; or (e) an adduct of each of the above.

35. The method of claim 35, wherein the nutriment comprises an animal product, a plant product, a beverage, or a mixture thereof.

36. The method of claim 35, wherein the chilled nutriment is a frozen nutriment.

37. A method for increasing rate of thermal inactivation of a pathogen in a nutriment, comprising:

contacting the nutriment with an acidulant to give a treated nutriment; and

5 chilling the treated nutriment.

38. The method of claim 37, wherein the acidulant comprises: (a) an acidic, or low pH, solution of sparingly-soluble Group IIA complexes ("AGIIS"); (b) a highly acidic metalated mixture of inorganic acid ("HAMMIA"); (c) a highly acidic metalated organic acid ("HAMO"); (d) a mixture of the above; or (e) an adduct of each of the above.

39. The method of claim 37, wherein the nutriment comprises an animal product, a plant product, a beverage, or a mixture thereof.

40. The method of claim 37, wherein the chilled nutriment is a frozen nutriment.

41. A method of extending case shelf-life of a nutriment, comprising:

contacting the nutriment with an acidulant.

42. The method of claim 41, wherein the acidulant comprises: (a) an acidic, or low pH, solution of sparingly-soluble Group IIA complexes ("AGIIS"); (b) a highly acidic metalated mixture of inorganic acid ("HAMMIA"); (c) a highly acidic metalated organic acid ("HAMO"); (d) a mixture of the above; or (e) an adduct of each of the above.

43. The method of claim 41, wherein the nutriment comprises an animal product, a plant product, a beverage, or a mixture thereof.